

(Nano Materials & Advanced Technology) Course Catalogue 2023-2024

College	Erbil Technology College	
Department	Construction & Materials Technology Engineering	
Module Name	Nano Materials & Advanced Technology	
Module Code	NMT475	
Semester	7	
Credit	5	
Module type	Theory & Tutorial	
Weekly hours	4	
Weekly hours (Theory)	(2)hr Class	() hr Workload
Weekly hours (Tutorial)	(2)hr Class	() hr Workload
Lecturer (Theory)	Yassin Ali Ibrahim	
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Lecturer (Practical)	Yassin Ali Ibrahim	
Email	Yassin.ibrahim@epu.edu.iq	

Course Book

▪ **Course overview:**

Related definitions, measurements for the characterization of nanomaterials, nanoparticles, , gain knowledge of production of nanomaterial, environmental impacts of nanotechnology, fate and transport of nanoparticles in the environment.

Students will gain an introduction to nanotechnology in this course, with a focus on the synthesis, characterisation, and applications of nanomaterials in environmental and civil engineering. Customizing mechanical properties, durability, self-cleaning, self-sealing, self-sensing, energy harvesting, and other multifunctionality are just a few of the specific applications that will be covered. It combines the disciplines of electrical engineering, civil engineering, and materials science. The fundamental ideas such as the relationship between process, structure, and property; the effect of nanoscale materials; the characterization of nano and microstructure properties; the creation of nanodevices; and their applications in environmental sensing, water infiltration, and energy harvesting will all be covered. Students enrolling in the course will have access to the lab to develop their abilities in nano- and micro-structure characterisation.

▪ **Course objective:**

Learn about types, production methods, application areas and possible damages of nano materials. Nanotechnology is a rapidly growing discipline in recent years, to have knowledge about its use for the benefit of the construction.

- Be able to describe the basics of concrete, steel, glass, wood, environment and their mechanical and durability performance.
- Be able to explain the fundamental mechanisms of nanomaterials effect on mechanical and durability properties of concrete and other construction materials.
- Be able to explain the fundamental principles behind the multifunctionality strategies - self-cleaning, self-healing, self-sensing, energy harvesting, and internal curing - applied to the concrete.
- Be able to identify appropriate methods of enhancing the performance of concrete based on implementing nanomaterials and nanotechnology.

▪ **Student's obligation**

- Students should be informed that the method of teaching the material is evaluated daily.
- After each tutorial work, report must be prepared.
- At the end of each week, a seminar should be presented.

▪ **Forms of teaching**

During the academic year, Data Show is used for full detailing, besides that a white board is used to solve the examples, and a software copy of the lecture will be handed, finally, a home work for the coming week will be announced.

▪ **Assessment scheme**

- Report
- Seminar
- Quiz
- Home Work
- Essay
- Exam

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Erbil Polytechnic University											
Erbil Technology College					Select		Min.				
Construction and Materials Technology Engineering					1 ECTS = 27		working hours				
Program: Technical Diploma (120 ECTS)					Lecturer Name						
Total No. of Weeks/Semester:		20 weeks			Yassin Ali Ibrahim						
Module Name:		Nano Materials and Advanced Technology			ECTS = 5		Theory	Practical	Tutorial		
Module Code:		NMT475	Group:	All	2	2	2				
ECTS Workload Calculation Form											
Activity	S	Description	Activity Type	No.	T.F. Range		Specific T. F.	Time Factor	Workload		
					Min	Max					
Course	1	Theory	In class	f	10			2	20		
			Online	f	2			2	4		
	2	Preparation (1-2) * Theory Hr.		h	12	2	4	2.3	2.3	27.6	
	3	Practical		f	12						
	4	Preparation (1-1.5) * Practical Hr.		h	12						
	5	Tutorial		f	12	2	2		2	24	
Site Visits and Lab Experiments	6	Preparation (0.5-1.5) * Tutorial Hr.		h	12	1	3	2	2	24	
	7	Scientific/Field Trips		f	0	2	6		2		
Assignment	8	Practical/Lab Reports		h	0	1	2	2	2		
	9	Homework		h	2	1	4	1	1	2	
	10	Report		h	2	1	4	2	2	4	
	11	Seminar		h	3	2	10	3	3	9	
	12	Paper		h							
	13	Essay		h	1	1	6	3	3	3	
Assessment	14	Project/Poster		h	0	4	15		4		
	15	Quiz		h	4	1	2	2	2	8	
	16	Mid Term	Theory		f	1			1	1	
			Preparation (1.5-3) * Theory Hr.		h	1	3	6		3	3
			Practical		f	1					
	17	Preparation (1-2) * Practical Hr.		h	1						
	18	Final	Theory		f	1			2	2	
			Preparation (3-5) * Theory Hr.		h	1	6	10		6	6
Practical			f	1							
Preparation (2-4) * Practical Hr.			h	1							
Face to face hours (f)/12 week		4.4		Face to face hours (f)				51			
Home hours (h)/16 week		6.8		Home hours (h)				86.6			
Total hours/16 week		10.1		Total hours				137.6			
ECTS (Total hours 137.6 / 27) ≈ 5							Accept		5.1		
(Min. 12 weeks active lecturing (Including Min Term exams with no stopping of lectures)+ 3 weeks Final & Re-sit Exams (Including one week break in between))											
Select time factor range from (Min., Av. or Max) in cell J2, if necessary write specific time factor in column J.											
f: Face to face activity hours					h: Household activity hours						
Yassin Ali Ibrahim											

Specific learning outcome:

1. Learn related definitions about nanotechnology
2. Gain knowledge about production of nanomaterials,
3. Learn how the spread and transport of nanoparticles to the environment
4. Toxicological effects of nanomaterials and measurement methods to be gained
5. Acknowledgement of nanotechnology used in pollution control

- Course Reading List and References:

- Key references:
 - Useful references: Nano Materials, Nano Technology, Nano Tubes, Nano Fibres
 - Magazines and review (internet): Engineering Magazines
- Reference books and resources are suggested as below:
 - Jiang, Guo and Lu, Nanoscience: Nanomaterial Nanotechnology Applications. ISBN: 978-1-1970059-00-7. Publisher: Engineered Science Publisher, 2019.
 - Guo, Hen and Lu, Multifunctional Nanocomposites for Energy and Environmental ISBN: 978-3-527-34213-6 Publisher: Wiley-VCH Inc, 2018.
 - Callister and Rethwisch, Fundamentals of Materials Science and Engineering: an integrated approach, John Wiley & Sons Inc, 2011
 - Rodgers, Nanoscience and Technology: A collection of reviews from Nature Journals, World Scientific Publishing, 2010.
 - Schodek, Ferreira and Ashby, Nanomaterials, nanotechnologies and Design: an introduction for engineers and architects, Elsevier Publishing, 2009

▪ Course topics (Theory)	Week	Learning Outcome
1. Introduction to nanotechnology	1	
2. Nano materials; nanotubes, nanocrystals, nanoparticles	2	
3. Nano materials; nanoporous solids,	3	
4. Production technology of nanomaterials	4	
5. Various application areas of nanotechnology	5	
6. Nano Technology in Civil Engineering	6	
7. Nano Technology in Concrete, Steel, Glass	7	
8. Design and Application of Polymer Clay Nano Composites	8	

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9. Application of Polymer Clay Nano Composites	9	
10. Nano Silica, Fly Ash	10	
11. Carbon Nanotubes	11	
12. Nano Titanium	12	
Practical Topics (If there is any)	Week	Learning Outcome
Not Applicable		
19. Examinations: -Mid Term Exam -Final Exam	7 14	
▪ Extra notes: None		
▪ External Evaluator		